

Q Fever

(Query Fever)



Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

Q fever is a bacterial disease caused by *Coxiella burnetii*. *C. burnetii* is classified as rickettsia and is an intracellular pathogen.

B. Clinical Description

While up to 60% of infections are asymptomatic, symptomatic infections present in two distinct forms: acute, which occurs just after initial exposure; and chronic, which can occur years after an initial infection. Acute infection may present as a non-specific febrile illness, with severe headache, myalgia, malaise, weakness, chills, severe sweating, and anorexia. Pneumonia or hepatitis occurs in up to 60% of acutely ill persons. The illness resolves gradually over 1–4 weeks, and life-threatening sequelae such as endocarditis and meningoencephalitis are rare. Approximately 1–2% of acute cases are fatal.

The chronic form of the disease is characterized by infection that lasts for more than six months. This form is far less common—occurring in less than 1% of infected persons—but more serious. Chronic Q fever may develop any time between 1–20 years after the initial infection. The most serious complication of chronic disease is endocarditis: infection of the valves of the heart. Patients with pre-existing valvular disease, cancer, and chronic kidney disease are at greater risk for the development of the chronic form of Q fever. The fatality rate for chronic Q fever is as high as 65%.

C. Vectors and Reservoirs

Goats, sheep, and cattle appear to be the most important animal reservoirs. Other potential reservoirs include: dogs, cats, feral rodents, and birds. Ticks appear to be important in maintaining the disease reservoir within animals and some birds. However, direct human infection from a tick bite is rare.

D. Modes of Transmission

Infected animals are usually asymptomatic, but they shed large numbers of organisms in placental tissue and amniotic fluid. The *C. burnetii* bacterium is most commonly transmitted through breathing in dust contaminated with dried placental material, birth fluids, or excrement from infected animals. Direct contact with infected animals or contaminated materials, such as straw, fertilizer, and laundry, is also a mode for transmission. *C. burnetii* has an extremely low infectious dose. A single inhaled organism may be enough to cause infection. *C. burnetii* is resistant to heat, drying, and many common disinfectants. The organism's ability to persist in the environment may result in a continued risk for infection weeks to months after an animal's birthing event. In rare cases, human infections have been reported to occur via intradermal injection, blood transfusion, and transplacentally. Transmission through ingestion of raw milk of infected cows or by tick bites is rare.

E. Incubation Period

The incubation period for acute Q fever varies, but it is generally 2–3 weeks. Signs and symptoms of chronic Q fever may develop anytime from 1–20 years after exposure.

F. Period of Communicability or Infectious Period

Direct person-to-person transmission of Q fever is rare.

G. Epidemiology

Q fever is a zoonotic disease that occurs worldwide. Human infection is presumably underreported. People having regular contact with sheep, goats, or cattle—such as veterinarians, meat processing plant workers, sheep and dairy workers, or livestock farmers—have the highest risk of exposure. In farming areas, seasonal disease trends occur with predictability, with the greatest increase in cases occurring around the lambing season during early spring.

H. Bioterrorist Potential

C. burnetii is listed by the Centers for Disease Control and Prevention (CDC) as a Category B bioterrorist agent. If acquired and properly disseminated, *C. burnetii* could cause a serious public health challenge.



Section 2:

REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any suspicion of Q fever brought to your attention by a health care provider or any positive laboratory result pertaining to Q fever. See Section 3C for information on how to report a case.

B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI) will perform testing for *C. burnetii*, the causative agent of Q fever. Clinical specimens such as nasopharyngeal swabs, bronchial/tracheal washings, and exudate from lesions can be tested by an antigen detection assay and by polymerase chain reaction (PCR). Specimens yielding positive results will be forwarded to the CDC for confirmation.

For additional information on testing and specimen submission, call the SLI Bioterrorism Response Laboratory (BRL) at (617) 590-6390.



Section 3:

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION**A. Purpose of Surveillance and Reporting**

- ◆ To identify the sources of infection, and to prevent further transmission.
- ◆ To identify and control outbreaks.

B. Laboratory and Health Care Provider Reporting Requirements

Q fever is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of Q fever, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of *C. burnetii* infection shall immediately report such evidence of infection directly to the MDPH within 24 hours.

C. Local Board of Health (LBOH) Reporting and Follow-up Responsibilities*Reporting Requirements*

MDPH regulations (*105 CMR 300.000*) stipulate that Q fever is reportable to the LBOH and that each LBOH must report any case of Q fever or suspect case of Q fever, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) using an official MDPH *Q Fever Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

Case Investigation

1. It is requested that LBOH complete a MDPH *Q Fever Case Report Form* (found at the end of this chapter) by interviewing the case and others who may be able to provide pertinent information. Much of the information required on the form can be obtained from the health care provider or from the medical record.
2. Use the following guidelines to assist in completing the form:
 - a. Demographic information: Complete as directed.
 - b. Exposure and clinical information: This section is particularly important to try to identify the source of the infection. Accurately record the patient's occupation, travel history, and exposure history to animals or unpasteurized milk. Also note whether other family members had any similar illness in the last year. If the patient was symptomatic, record the patient's onset date, and check off the appropriate clinical signs and symptoms. Also note any pre-existing medical conditions the patient has, whether they were hospitalized, and what the outcome was. Also record the clinician's name and contact information.
 - c. Laboratory data: Accurately record all available laboratory data including the name of the testing laboratory, the date the specimen was collected, and the type of testing done. Attach copies of any laboratory results, if available.

- d. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reasons why it could not be filled out completely.
3. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked "Confidential") to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)
305 South Street, 5th Floor
Jamaica Plain, MA 02130
Fax: (617) 983-6813

4. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.



Section 4:

CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (*105 CMR 300.200*)

None.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If the number of cases of Q Fever reported in your city/town is higher than usual or if you suspect an outbreak, please contact the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850 as soon as possible. This situation may warrant an investigation of clustered cases to determine a course of action to prevent further cases. The MDPH Division of Epidemiology and Immunization can also perform surveillance for cases across town lines, which would otherwise be difficult to identify at the local level.

D. Preventive Measures

In the U.S., Q fever outbreaks have resulted mainly from occupational exposure involving veterinarians, meat processing plant workers, sheep and dairy workers, livestock farmers, and researchers at facilities housing sheep. Prevention and control efforts should be directed primarily toward these groups and environments.

The following measures should be used in the prevention and control of Q fever:

- ◆ Assure appropriate disposal of placenta, birth products, fetal membranes, and aborted fetuses at facilities housing sheep and goats.
- ◆ Restrict access to barns and laboratories used in housing potentially infected animals.
- ◆ Use only pasteurized milk and milk products.
- ◆ Use appropriate procedures for bagging, autoclaving, and washing of laboratory clothing.
- ◆ Vaccinate (where possible—see below) individuals engaged in research with pregnant sheep or live *C. burnetii*.
- ◆ Quarantine imported animals.
- ◆ Ensure that holding facilities for sheep are located away from populated areas. Animals should be routinely tested for antibodies to *C. burnetii*, and measures should be implemented to prevent airflow to other occupied areas.
- ◆ Counsel persons at highest risk for developing chronic Q fever, especially persons with pre-existing cardiac valvular disease or individuals with vascular grafts.

A vaccine for Q fever is only available through military sources at Fort Detrick in Maryland. The vaccine is strongly recommended for those knowingly working with live *C. burnetii* in a laboratory setting. It may be considered for abattoir workers and others in hazardous occupations.

Persons wishing to be vaccinated should first have a skin test to determine a history of previous exposure. Individuals who have previously been exposed to *C. burnetii* should not receive the vaccine because severe reactions, localized to the area of the injected vaccine, may occur. A vaccine for use in animals has also been developed, but it is not available in the U.S.



ADDITIONAL INFORMATION

C. burnetii exists in two antigenic phases called phase I and phase II. In acute cases of Q fever, the antibody level to phase II is usually higher than that to phase I, often by several orders of magnitude, and generally is first detected during the second week of illness. In chronic Q fever, the reverse is true. Antibodies to phase I antigens of *C. burnetii* generally appear later and indicate continued exposure. Thus, high levels of antibody to phase I in later specimens in combination with constant or falling levels of phase II antibodies and signs of inflammatory disease suggest chronic Q fever. Antibodies to phase I and II antigens have been known to persist for months or years after initial infection.

The following is the formal CDC surveillance case definition for Q fever. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.

Case Classification

Probable	A clinically compatible case with a single supportive immunoglobulin G (IgG) or immunoglobulin M (IgM) titer, as defined by the testing laboratory.
Confirmed	<p>A clinically compatible case that is laboratory-confirmed with:</p> <ul style="list-style-type: none"> ◆ Four-fold or greater change in antibody titer to <i>C. burnetii</i> antigen by IFA or CF antibody test; ◆ A positive PCR assay; ◆ Isolation of <i>C. burnetii</i> from a clinical specimen by culture; or ◆ Positive immuno-staining of <i>C. burnetii</i> in tissue.



REFERENCES

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“Q Fever.” Centers for Disease Control and Prevention. February 13, 2003.
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CDC. Q Fever—California, Georgia, Pennsylvania, and Tennessee, 2000–2001. *MMWR*. 51(41): 924–927.



FORMS & WORKSHEETS

Q Fever (Query Fever)

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LBOH Action Steps

This form does not need to be submitted to the MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to Q fever case investigation activities.

LBOH staff should follow these steps when Q fever is suspected or confirmed in the community. Also report any exposure to *C. burnetii* that may be bioterrorist in nature. For more detailed information, including disease epidemiology, reporting, case investigation and follow-up, refer to the preceding chapter.

- ☐ Notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report any suspect or confirmed case(s) of Q fever.
- ☐ To report a case or suspect case of Q fever in an animal, contact the Massachusetts Department of Agricultural Resources (MDAR), Division of Animal Health, Dairy Services and Biosecurity (DAH) at (617) 626-1795 or fax the information to the DAH at (617) 626-1850.
- ☐ Assist MDPH with obtaining clinical specimens needed for laboratory confirmation, if necessary.
- ☐ Fill out a MDPH *Q Fever Case Report Form* (attach laboratory results). Be sure to accurately record the patient's occupation, travel history, and exposure history to animals or unpasteurized milk.
- ☐ Identify other potentially exposed persons.
- ☐ Send the completed case report form (with laboratory results) to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).